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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/274,194	03/22/1999	JOHN E. LANG	LAM2P266	8105

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EXAMINER

SONG, MATTHEW J

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 09/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/274,194

Applicant(s)

LANG, JOHN E.

Examiner

Matthew J Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 20-38 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 20-38 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 20-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tobben (US 6,066,569) in view of Chen et al (US 5,700,740).

Tobben discloses a process for manufacturing silicon integrated circuits, note entire reference. A silicon substrate is provided. An organic material free of silicon is deposited over the semiconductor substrate. The material can be parylene. This reads on the applicant's limitation that low dielectric constant material is disposed over a semiconductor substrate. A hard mask material overlies the low dielectric constant layer. The layer may comprise a single layer of silicon oxide or a dual layer of silicon oxide covered by a layer of silicon nitride. The

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mask layer is covered by a layer of photoresist that has been patterned to provide an opening (Column 3, lines 10-20). An opening is then etched through the mask layer. The workpiece is subjected to an etch to extend the opening only partly through the mask layer. The original photoresist is stripped (column 3, lines 21-37). Tobben also discloses oxygen plasma is normally used for resist stripping (column 3, lines 55-65).

Unlike the claimed invention, Tobben does not disclose a method wherein the photoresist material is removed with dimethyl sulfoxide.

In a method of fabricating integrated circuits on a semiconductor substrate of silicon, note entire reference, Chen et al teaches a silicon substrate 2 and photoresist film 5 is deposited thereon on and patterned (column 3, lines 30-67). Chen et al also teaches the photoresist is stripped off, either by ashing with an oxygen containing plasma or by using a suitable solvent such as ACT-690, which is photoresist stripper consisting of a mixture of dimethyl-sulfoxide (column 4, ln 25-40). This reads on applicant's limitation of removing the photoresist layer from the over the hard mask layer with dimethyl sulfoxide of a high pressure liquid chromatography (HPLC) grade.

Unlike the claimed invention, neither Tobben nor Chen et al teach a method wherein a high selectivity of the dimethyl sulfoxide of HPLC grade toward a low dielectric constant material of the low dielectric constant layer causes the dimethyl sulfoxide to chemically dissolve the photoresist layer from over the hard mask layer without substantially damaging the low dielectric constant layer. Chen et al does teach the dimethyl sulfoxide chemically dissolved the photoresist layer. Since the dimethyl sulfoxide layer chemically dissolves the photoresist layer

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and the same process steps are performed, it is inherent that the dimethyl sulfoxide has a high selectivity toward a low dielectric constant material, absent evidence to the contrary.

Chen et al teaches using dimethyl sulfoxide or an oxygen plasma to remove photoresist, this is a teaching that using dimethyl sulfoxide or an oxygen plasma are equivalent methods of removing photoresist. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Tobben by using dimethyl sulfoxide to remove the photoresist as taught by Chen et al because substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06).

Response to Arguments

3. Applicant's arguments filed 7/11/2003 have been fully considered but they are not persuasive.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Chen et al teaches removing a photoresist layer by using dimethyl-sulfoxide or by ashing with an oxygen containing plasma. Tobben teaches removing a photoresist layer using oxygen plasma. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Tobben with Chen's dimethyl-sulfoxide method of removing photoresist

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because substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06).

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Applicant alleges dimethyl sulfoxide would not inherently have a high selectivity toward a low dielectric constant material because Chen does not teach using low constant dielectric materials (pg 8, First paragraph and pg 8, Third paragraph). Chen is not relied upon to teach the use of low constant dielectric material, this feature is taught by Tobben. Chen is relied upon solely as a teaching of removing photoresist using dimethyl sulfoxide. The combination of Chen and Tobben teach all of the process limitations claimed, therefore a similar process of using dimethyl sulfoxide on a similar low constant dielectric material would have a high selectivity toward a low dielectric constant material.

Applicant's argument that Chen does not teach using dimethyl sulfoxide of high pressure liquid chromatography is noted but is not found persuasive. Chen teaches using dimethyl sulfoxide. Applicant alleges that Chen teaches that dimethyl sulfoxide of HPLC grade has a different grade than a mixture that includes dimethyl sulfoxide and other components (pg 8). However, the instant claims are not limited to only dimethyl sulfoxide, therefore the dimethyl sulfoxide taught by Chen would read on applicant's grade. Furthermore, if a difference between the dimethyl sulfoxide taught by Chen and Applicant did exist, then it would have been obvious to a person of ordinary skill in the art at the time of the invention to using a purer dimethyl

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sulfoxide of high pressure liquid chromatography because purity is held to be obvious (MPEP 2144.04 VII).

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Khor et al (US 5,882,850) teaches dimethyl sulfoxide (DMSO) should an acceptable grade, typically HPLC grade or equivalent, as obtained from a vendor (col 3, ln 45-55).

Adams et al (US 5,190,860) teaches dimethyl sulfoxide of high-pressure liquid chromatography grade from Aldrich (col 8, ln 10-15).

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

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6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS

NADINE G. NORTON
PRIMARY EXAMINER

